

Climate Change in South Asia

Strong Responses for Building
a Sustainable Future

Asian Development Bank

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Contents

1	Foreword
2	Issues, Impacts, and Responses
4	Projected Impacts of Climate Change
9	Other Natural Disasters
10	ADB in Action
14	Climate Change Solutions at the Regional and Country Levels
	Regional Responses
	Country-Specific Responses
	Going Forward

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FOREWORD

Climate change is an issue that many have called the greatest development challenge of our generation. And through our Strategy 2020, the Asian Development Bank (ADB) has committed to reduce impacts of climate change as part of our efforts to achieve environmentally sustainable economic growth.

What happens in South Asia will clearly have a profound impact since the countries of this region are growing rapidly and are extremely vulnerable to climate impacts. If we cannot successfully meet the climate challenges here, then there is little chance that the world will be successful either.

Thankfully, Asia has not been idle and South Asia in particular is emerging as a global leader in aggressively responding to climate change. Through the South Asian Association for Regional Cooperation, countries have committed to a shared set of priorities in addressing climate change including ambitious targets for clean energy and low-carbon technology development, as well as commitments to improve resilience of

communities and economies. Efforts to secure adequate water and food supplies are of critical importance.

All countries in South Asia are also working to address climate change at the national level. The following pages discuss the different approaches to addressing the diverse and urgent adaptation and mitigation needs in every country in South Asia, many with support from ADB.

This publication is intended to not only heighten general awareness about climate change in South Asia and emerging policies and strategies but also to invite cooperation among partners to scale up successful responses to climate change, and mobilize additional financial and technical resources that countries in South Asia urgently need.

We will continue to increase efforts and deepen partnerships to help South Asian nations, and partners around the world, to move toward a more climate-secure future.

Sultan Hafeez Rahman
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Issues, Impacts, and Responses

The South Asia region stretches from the towering Himalayan peaks of Bhutan and Nepal, to the fertile delta of Bangladesh and peninsula of India, and the jewel-like islands of Sri Lanka and the Maldives in the Indian Ocean. Covering climatic zones as diverse as its physical landscape, the region is experiencing an array of climate change impacts, including glacial melt, forest fires, rising sea levels, mountain and coastal soil erosion, and saline water intrusion.

Abnormal monsoon patterns and more frequent and intense storms have aggravated natural disasters and climate change impacts in recent years. Bearing the brunt of these are the more

than 600 million absolute poor—more than half of the world's total poor—living in the region, who depend on climate-sensitive sectors including agriculture, forestry, and traditional fishing for much of their day-to-day needs.

With changes in the global climate system likely to span into the next century, geography, high population density, and immense poverty will continue to make South Asia especially vulnerable. Human health, biodiversity, agricultural production, food security, water, energy, and coastal settlements will be imperilled, as natural disasters worsen and migration grows—intensifying stresses on major cities.

In partnership with developing member countries, ADB continues to respond to these enormous climate change challenges. ADB assists in reducing greenhouse gas emissions, focusing on the energy, urban, and transport sectors. ADB will help reduce South Asia's vulnerability by undertaking climate and disaster risk screening of projects, assisting in the integration of climate change in national development, and strengthening capacities in adaptation planning and implementation.

Consistent with ADB's Strategy 2020 to incorporate environmental sustainability in the fight against poverty, climate change efforts are guided by five strategic priorities:

- expanding the use of clean and renewable energy;
- encouraging sustainable transport and urban development;
- promoting climate-resilient development, especially in the agriculture- and water-dependent sectors;
- strengthening policies, governance, and capacities; and
- managing land use and forests for carbon sequestration.

- The snowy mountains of Himachal Pradesh, India

Projected Impacts of Climate Change

South Asia is vulnerable to several climate change issues and impacts tied closely to the region's geography, economy, and population patterns

Glacial Melt

The Water Towers are Crumbling

The Himalayas are a lifeline to some 1.5 billion people living directly in the floodplains of its many rivers. About 10% of the volume of Himalayan rivers comes from melting water from glaciers, which are essential to sustain river flows during dry seasons.¹ But with rising temperatures, the ice mass of the Himalayas is retreating more rapidly than the global average. The impact of climate change is predicted to cause marked changes in seasonal rather than annual water availability in the Himalayan Basin. Reduced water availability during the summer months—which represents about 60% to the annual flow—may have serious impacts on the region when people need water most for irrigation, hydropower, and more.² With 80% of water in the upper Satluj River in India coming from snow melt and 20% from glacier melt, changes in snow melt and snow cover patterns will also have effects on river flow in the near term.

Accompanying the glacial melt is the formation and continuing growth of glacier lakes. According to recent studies by the International Centre for Integrated Mountain Development (ICIMOD), there are 20 potentially dangerous glacial lakes in Nepal and 25 in Bhutan³ posing the risk of outburst floods to outlying communities. India is also witnessing the formation and spread of glacial lakes.

¹ ADB. 2009. Building Climate Resilience in the Agriculture Sector in Asia and the Pacific. Manila: ADB / International Food Policy Research Institute.

² Pratap Singh and Lars Bengtsson. 2004. Hydrological sensitivity of a large Himalayan basin to climate change. *Hydrological Processes*.

³ Jack D. Ives, Rajendra B. Shrestha, and Pradeep K. Mool. May 2010. *Formation of glacial lakes in the Hindu Kush-Himalayas and GLOF (glacial lake outburst flood) risk assessment*. Kathmandu. ICIMOD.

Erosion

Losing Land and Livelihoods

Increasing flooding, surges, storms, rainfall, sea-level rise, and human activity are all causes of worsening erosion in the region. Coastal areas, overgrazed rangelands, and denuded mountains are particularly affected. In India, 26% of the coastline is prone to erosion, with 450 hectares of land lost every year. Sri Lanka's coastline is subject to significant erosion in certain areas, while the hill country is prone to frequent landslides. In mountain communities in Bhutan, India, and Nepal, landslides are occurring with disturbing regularity. The loss of land is damaging economies, agriculture, and habitats, and constricting livelihood opportunities, particularly of the rural poor. With more extreme weather events likely due to climate change, coastal and mountain soil erosion in South Asia will worsen over the next decades.



- Infrastructure damaged by a landslide in Nepal

Sea-Level Rise

Rising Tides, Settlements at Risk

The region's long and heavily settled coastlines are seriously threatened by sea-level rise. In Bangladesh alone, sea level is predicted to rise 45 centimeters by 2050, affecting 10%–15% of the land area and an estimated 35 million people.⁴ Sea level is also projected to rise by around 15–38 centimeters in India by 2050, placing major cities driving regional growth at risk, including Kochi, Kolkata, and Mumbai. A high proportion of Sri Lankan coastal land is less than 1 meter above sea level, and could be submerged with the rising tides, along with critical transport infrastructure.

The Maldives' very survival is in jeopardy, as the average height of its islands is 1.5 meters above sea level, and its highest point is less than 2 meters above sea level. The grave risks posed by sea-level rise could trigger large-scale migration, with ripple effects across borders. Sea-level rise gives way to saline water intrusion, threatening drinking water supply, agriculture, and aquaculture. In Bangladesh, more than 100 million hectares of arable land are affected. All of the Maldives is affected by saline water intrusion due to rising sea levels.

⁴ Government of Bangladesh, Department of Environment. 2007. *Climate Change Cell*. Dhaka.



- Aftermath of storm surge in Ullal, Karnataka, India

Floods

Danger of Deluge

Significant portions of Bangladesh, India, Nepal, and Sri Lanka are prone to recurrent flooding due to such factors as heavy monsoon rains, blocked natural drainage, and low elevation. Melting glaciers and rising seas with greater probability of flooding and storm surges caused by climate change will put Bangladesh at particular risk, as three large river systems converge there, merging the rainwater they collect from a catchment area 12 times the size of the country. Bangladesh

floods could last up to 9 months a year. In 2007, abnormal monsoon rains caught South Asia unprepared to cope with the floods that affected an estimated 30 million people from Bangladesh, India, and Nepal. While rainfall patterns may continue to vary, recently observed trends in the increasing intensity of tropical cyclones and storm surges, partly attributable to rising sea surface temperatures, raise the possibility of an even stormier future.

Other Natural Disasters

South Asia is extremely vulnerable to natural disasters, and a significant portion is exposed to more than one type of hazard. Between 1990 and 2008, more than 750 million people—50% of South Asia’s population—were affected by at least one type of disaster, resulting in almost 230,000 deaths and about \$45 billion in damages.⁵ Aside from floods, which have accounted for over 50% of the more than 900 disaster events reported in the region in the last 4 decades, disasters frequenting the region include landslides, windstorms, sea surges, and cyclones. Although comprising only 2% of the total number of events, droughts hit the most number of people—more than 50% of the total disaster-affected population.

Bangladesh and Nepal experienced the highest number of disaster events. But due to its infrastructure density, India had the biggest share of damages—\$26 billion or over 50% of total damages for the region.

The probability of climate-related disasters will rise with changes in precipitation patterns and temperature increase. Droughts are projected to be more intense and prolonged in the arid and semiarid areas of India and Bangladesh, while landslides and glacial lake outburst floods will be more frequent in the mountain regions of Bhutan and Nepal.

⁵ World Bank. 2009. *Why is South Asia Vulnerable to Climate Change?* <http://go.worldbank.org/OJ4FWPUB10>

ADB in Action

ADB responds to climate change with five strategic priorities

Expanding the Use of Clean and Renewable Energy

Power sector development is a complex challenge for South Asia. Population and economic growth require more energy to be available in more locations, yet the region is often constrained from pursuing low-carbon options that will help mitigate climate change. Overall, South Asia's emissions have risen by 3.3% annually since 1990. India, which accounts for about 85% of the region's population and more than 80% of gross domestic product, has become the world's seventh-largest greenhouse gas emitter due to heavy dependence on coal—although per capita and per unit of greenhouse gas emissions in India remain low by international standards. Power generation in India will continue to be dominated by coal for the foreseeable future.⁶

Energy efficiency must be combined with technological innovations to reduce the carbon intensity of the power sector. In parallel, renewable energy development and regional energy trading must be bolstered, taking into account environmental stresses. Measures to deal with rising peak electricity demands due to higher temperatures and risks posed by extreme weather events, including greater sedimentation from flooding that could affect hydropower, must be considered. A more resilient energy sector is critical to sustainable economic growth.

Greenhouse gases from energy use and generation represent more than half of Asia's emissions. The foundation of ADB's mitigation strategy is curbing growth in energy demand by increasing energy efficiency and meeting energy needs through low-carbon options.

⁶ ADB. 2007. *Summary Initial Environmental Examination. India: National Power Grid Development Investment Program*. Manila.

Areas targeted for energy efficiency are the commercial, industrial, and residential sectors, as well as municipalities.

ADB works in collaboration with industry associations, domestic banks, specialized energy efficiency agencies, and service companies. To help countries meet their electricity needs, ADB assists in efforts to upgrade transmission and distribution systems, and promote clean technology and renewable energy development.

Encouraging Sustainable Urban Development and Transport

South Asia has been one of the least urbanized regions in the world, with an urban population representing only about 28% of its total of 1.4 billion people. However, urban growth rates of 2.53% have eclipsed global and regional averages (UN Population Division 2007)⁷ and set its cities on a path to rapid expansion. Infrastructure gaps, social service deficits, and urban management issues, associated with the region's largely unplanned urbanization, will be intensified by the sudden spikes in urban-rural migration due to climatic changes and other drivers. Urban poverty incidence, already at 50%, is projected to increase. Climatic risks such as sea-level rise, rising temperatures, and extreme weather events will amplify the vulnerability of South Asian cities. About 14% of the region's urban population, totaling about 400 million, live in coastal and major river delta areas that are 10 meters or less above sea level.⁸ Impacts will be most pronounced in the megacities of Delhi, Dhaka, Kolkata, and Mumbai.

Measures to strengthen the resilience of South Asian cities include closing gaps in critical infrastructure, social services, and urban environmental management, especially those pertaining to water and sanitation, health services delivery, waste management, and disaster risk reduction. Opportunities to pursue low-carbon, climate-resilient growth abound in the urban sector. This should also be harnessed by incorporating energy efficiency in the design of buildings and water infrastructure, as well as by integrating environmental sustainability and sound mobility into transport and land use plans. Although transport sector emissions are growing more slowly in South Asia than other regions, the growing mobility of new urban populations indicates further challenges ahead.

ADB supports the development of competitive and livable cities with reduced carbon footprints. Priorities are green space, energy-efficient buildings and water supply, and reductions in greenhouse gas emissions from waste and urban transport. The Sustainable Transport Initiative supports investments in low-carbon, safe, and affordable public transport systems, helping countries develop inclusive, clean, and energy-efficient transport projects and providing ongoing assistance to design sustainable transport policies. The Cities Development Initiative for Asia is a regional partnership program supported by ADB and the governments of Germany, Sweden, and Spain to assist medium-sized Asian cities to bridge the gap between their development plans and the implementation of their infrastructure investments. This will provide technical support to cities in areas where current modes of development assistance are unavailable.

⁷ United Nations, Population Division. 2007. *Urban Population, Development and the Environment*. www.un.org/esa/population/publications/2007_PopDev/Urban_2007.pdf

⁸ World Bank. 2009. *Why is South Asia Vulnerable to Climate Change?* <http://go.worldbank.org/OJ4FWPUB10>

ADB's Comprehensive Mobility Plans and Bus Rapid Transit Feasibility Studies for India will enable policy makers to prioritize investments that shift the transport sector onto a low-carbon path while meeting development needs. In Bangladesh, the Greater Dhaka Sustainable Urban Transport Corridor project, which features a Bus Rapid Transit component, is currently in the preparatory stages. ADB's Carbon Market Program is supporting the development of urban solid waste management projects that qualify as Clean Development Mechanism projects under the Kyoto Protocol, making them eligible to benefit from additional financing from the sale of carbon credits to countries with emissions reduction responsibilities.

Promoting Climate-Resilient Development

Water resources in the region are highly sensitive to climate change. Changing rainfall patterns coupled with rising temperatures may trigger loss of soil moisture and water retention capacity, affecting household and industrial water supplies, hydropower generation, and agricultural production. Increased runoff in the region's major rivers caused by changes in rainfall and glacial melt are projected by 2050. Significant declines in river flows are likely to occur later in the century, resulting in severe water shortages.

ADB provides policy advocacy and technical guidance to address climate change and vulnerability issues in agriculture, water, and other sensitive sectors. Our water sector initiatives are designed and planned to cope with the impacts of climate change by reducing water losses and

applying integrated water resources management to improve the resilience of communities and economies to climate change.

Strengthening Policies, Governance, and Capacities

Ensuring successful climate change programs and projects depends in great part on good governance measures to strengthen institutions, policies, and capacities of government counterparts. ADB's Strategy 2020 specifies good governance and capacity building as a key driver of development. In this respect, ADB works to strengthen its implementing partners, enabling them to carry out more effective climate change programs and projects.

Given the significant investments that are devoted to climate change challenges, ADB keeps close watch so that its resources are utilized as intended. Under its second Governance and Anticorruption Action Plan, ADB conducts systematic risk assessment at the program and project level to develop appropriate risk mitigation plans. These plans are regularly monitored and include measures to enable implementing agencies to put in place appropriate financial management, procurement, and anticorruption policies and activities. In addition, ADB's commitment to good governance requires that its climate change responses are crafted following extensive consultation processes and civil society engagement to ensure broad ownership and sustainability.

To enhance the ability of governments to implement institutional and policy responses

to climate change, ADB provides technical assistance and capacity building support in various levels and areas of government—from assisting government ministries in crafting climate-supportive policies to helping country stakeholders better understand climate science and good practices required to properly respond to country-specific needs. This process is facilitated by ADB's support for climate change research as well as the wider public dissemination of such research.

Managing Land Use and Forests for Carbon Sequestration

Drastic and innovative measures are needed to help farmers and consumers cope with the changes in regional weather patterns in South Asia. The production of rice and wheat, and some fruits and vegetables, are already seeing declines. Approximately one-third of greenhouse gas emissions in the region are caused by changing forests to agricultural land, which also deeply impacts the region's biodiversity.

Further degradation of arid and semiarid areas, changes in sediment balance, and increasing salinity of low-lying lands will reduce agricultural productivity and eventually the availability of land for agriculture. Crop losses from natural hazards and extreme events will

also take a toll on agriculture. Unpredictable monsoon rains will continue to significantly affect agricultural production. If current trends persist, crop yields will decrease significantly as a result of climate change-induced water stress, increasing prices for important agricultural crops such as rice, maize, wheat, and soybeans, and leading to greater malnutrition in the region by 2050.⁹ Over time, water scarcity is predicted to be the greatest impediment to agricultural growth in the region. The rural poor, who comprise 75% of the region's total poor, will be worst affected as they rely heavily on agriculture for their livelihoods.

Improving forest and agricultural land management are among the most cost-effective ways to reduce greenhouse gas emissions. ADB is helping countries prepare for and gain access to climate financing in exchange for improved management practices, such as those supported by the framework of Reducing Emissions from Deforestation and Forest Degradation (REDD).

Improving agriculture and forestry practices can help countries mitigate and adapt to climate change. By providing integrated technical assistance and lending, ADB helps countries maximize opportunities to secure peoples' livelihoods from climate impacts, plus supplement incomes with new sources of revenue from carbon sequestration.

⁹ ADB. 2009. *Building Climate Resilience in the Agriculture Sector in Asia and the Pacific*. Manila: ADB / International Food Policy Research Institute.

- Water pumping house station situated on the river Netrawati in Thumbay, India

Climate Change Solutions

at the Regional and Country Levels

Regional Responses

The most severe impacts of climate change cut across boundaries. In response, South Asian developing member countries have reaffirmed their commitment to work together in addressing common challenges. In 2007, the South Asian Association for Regional Cooperation (SAARC) Council of Ministers adopted the SAARC Declaration on Climate Change calling on SAARC leaders to collectively assess and respond to climate change risks and impacts. In 2008, the SAARC Environment Ministers Dhaka Declaration on Climate Change included a 3-year action plan that urges the international community to promote partnership and provide additional finance to address climate

change. In their 25th Jubilee Year, the SAARC Summit in 2010 concluded with the Thimphu Declaration on Climate Change, which sets an ambitious goal for South Asia to lead the world in furthering renewable energy, cutting carbon emissions, and reducing poverty while strengthening resilience to climate change.

Other regional organizations are taking supportive actions as well. The Asian Disaster Preparedness Center assists in enhancing capacities and skills, implementing policies, disseminating information and expertise, and raising awareness to better prepare for disasters.

In synergy with South Asian country and regional initiatives, ADB is integrating public education and awareness campaigns into capacity building projects and programs in vulnerable sectors. ADB has formulated Climate Change Implementation Plans for all developing member countries in the region and is also supporting informal knowledge networks and providing technical assistance to support regional training events. ADB is supporting agricultural research centers to project the impact of climate change and identify suitable responses. An analysis of the Economics of Climate Change in South Asia will help determine the least-cost mitigation and adaptation options that can be pursued. A study

on the impacts of glacial melt on water resources and energy, conducted with the International Centre for Integrated Mountain Development, will address extreme events, climate variability, and disaster scenarios. Clean Development Mechanism opportunities are being studied and explored in Bangladesh, India, and Sri Lanka on rail projects. The results will be used in guiding and developing existing or future rail projects in South Asia. A study on the Methodology for Estimating Carbon Footprint of Road Projects using India road projects as a case study was completed. The report documents a carbon footprint calculation methodology and field data in validating the methodology for ADB road projects.

Country-Specific Responses

Bangladesh

The Government of Bangladesh instituted Climate Change Cells (CCCs) in 2004 in climate-relevant ministries and line agencies to mainstream climate change issues in development activities. A Climate Change Unit was established in the Ministry of Environment and Forest in 2010 to facilitate and coordinate with the CCCs and manage climate change funds. The National Adaptation Programme of Action (NAPA) was completed in 2005 and further updated in 2009. In 2008, the government adopted the Bangladesh Climate Change Strategy and Action Plan (BCCSAP), focusing on six priorities: food security, social protection and health; comprehensive disaster management; infrastructure development; research and knowledge management; mitigation and low-carbon development; and capacity building and institutional strengthening. A

Climate Change Trust Fund with an allocation of \$100 million for fiscal year 2009–2010 and another \$100 million for fiscal year 2010–2011, and the Bangladesh Climate Change Resilience Fund (BCCRF) with commitments of £60 million from the United Kingdom, €8.5 million from the European Union, and DKK10 million from Denmark, have also been set up. Supported by ADB, World Bank (WB), and the International Finance Corporation, Bangladesh is preparing a Strategic Program for Climate Resilience under the Pilot Program for Climate Resilience of the Climate Investment Funds which, in line with the BCCSAP, will fortify embankments, raise coastal greenbelt; improve drainage, connectivity and water resource management; promote climate resilient agriculture and food security; and ensure that drinking water is safe in vulnerable coastal communities.

- Mountaintop settlement in Bhutan

To support the government's action plan, ADB is helping enhance the capacity of its key climate institutions in project preparation and implementation, and policy formulation. ADB also launched the Sustainable Power Sector Development Program in 2007 to ramp up clean-fuel power production and enhance reliability and efficiency of transmission networks. The Urban Governance and Infrastructure Improvement II Project, initiated in 2008, works to improve the environment and quality of life, reduce greenhouse gas emissions, and strengthen climate resilience by enhancing the governance capacity of *pourashavas* (secondary towns) and expanding access to urban infrastructure and services. The Emergency Disaster Damage Rehabilitation Project is helping the country recover from the damage caused by floods and

cyclone Sidr in 2007, and cyclone Aila in 2009. The Second Crop Diversification Project will identify and develop new varieties of resilient crops and alternative cropping patterns capable of withstanding weather extremes, flooding, pests, and disease. Khulna, Bangladesh's third-largest city, is under stress due to the reduced flow of the Ganges River, sea-level rise and intense rainfall events. The study Strengthening the Resilience of the Water Sector in Khulna to Climate Change aims to direct an integrated approach, by making recommendations on how to strengthen the design and implementation of ADB's **drainage** and water supply projects to withstand climate impacts.

Bhutan

Bhutan completed its National Adaptation Programme of Action in 2006. A National Environment Commission (NEC) serves as the focal agency for climate change, and its high-level commission members form the National Climate Change Committee. Bhutan's policy guidelines of Vision 2020 and Good Government Plus emphasize ramping up climate change mitigation by developing hydropower and solar energy resources.

ADB's support in capacity development has focused on integrated water resources management, hydropower and renewable energy development, and Clean Development Mechanism (CDM). The country's CDM efforts have recently yielded the Green Power Development Project, which became the first cross-border CDM

project to be registered and recognized by the United Nations Framework Convention on Climate Change (UNFCCC) in April 2010. The project, launched in 2008 with financing from ADB, is furthering regional clean power trade and access to renewable energy for the rural poor by extending the power grid and providing electricity from hydropower to 8,767 rural households and facilities. Export of this clean power lowers greenhouse gas emissions of the coal-dominated Indian power market by 500,000 tons per year. The project also provides electricity from solar energy to 119 remote, off-grid public facilities. ADB is also assisting Bhutan in coming up with a Bhutan Transport 2040 Integrated Strategic Vision. A transport task force will be formed to guide Bhutan in long-term sustainable transport development.

India

India launched its National Action Plan on Climate Change in June 2008 under which it has established eight national missions to address various aspects of climate change mitigation and adaptation. These are the National Missions on Solar Energy, Enhanced Energy Efficiency, Sustainable Habitat, Water, Sustaining the Himalayan Ecosystem, Greening India, Sustainable Agriculture, and Strategic Knowledge for Climate Change.

ADB is supporting India's National Water Mission by preparing a strategic framework

for meeting the climate challenges in the water sector, assessing potentials for improving water-use efficiency, and developing a roadmap for effective institutions, specialist training, and awareness on integrated water resource management.

ADB has also been supporting renewable energy development in India, specifically wind power in Gujarat and Karnataka, and hydropower generation in Himachal Pradesh. It proposes to support transmission of solar power in states such as Gujarat and Rajasthan.

In Kanpur, ADB has financed a project that delivers compressed natural gas to vehicles and piped natural gas to commercial, industrial, and residential users.

The Sustainable Coastal Protection and Management project will use environment-friendly technology and natural protection measures such as the restoration of dunes, and planting of mangrove and other trees for stabilizing and protecting the coastlines of Goa, Karnataka, and Maharashtra. It will also develop the institutional capacity for coastal protection and

management, and involve the private sector and local communities in the planning, design, and maintenance of the projects.

In the urban sector, efforts have been initiated to address mitigation and adaptation dimensions in urban development. For example, the Kerala Sustainable Urban Development project will improve infrastructure and services related to water and sanitation, drainage, solid waste management, and roads and transport. This will strengthen adaptive capacities and reduce greenhouse gas emissions as well.



Nepal

Nepal finalized its National Adaptation Programme of Action in 2010. The Ministry of Environment serves as a focal ministry of climate change related activities and has recently established a climate change management division. A multi-stakeholder Climate Change Initiatives Coordination Committee was started in April 2009 to foster a unified and coordinated climate change response. Nepal launched a 3-year interim sustainable development plan (2007–2010) that focuses on improving environmental management and sustainable natural resource use with the aim of maintaining a 39.6% forest cover. The plan also includes upgrading the country's water infrastructure and weather forecasting facilities, and developing Clean Development Mechanism-eligible renewable energy and community forestry projects.

ADB is assisting in strengthening Nepal's capacity to manage climate change and the environment.

An improved institutional framework, including legislation to operate a dedicated institution, determination of funding mechanisms, and the promotion of public education, information, and awareness are expected from this assistance. Also in preparation is a planning tool to assess community-based vulnerability, map risks, and plan adaptation interventions. Nepal lies in the Himalaya–Hindu Kush region that has been described as a climate change “white spot”—a location with little or no observed climate data—by the Intergovernmental Panel on Climate Change. This makes it imperative that as much high-quality observational data as possible are obtained to develop and validate climate model projections. ADB is supporting the preparations of downscaled climate change projections and impact scenarios for policy development and further impact analyses at the sector level.



The activities are expected to provide necessary information for awareness raising, training activities, and planning future projects.

The government is currently preparing a Strategic Program for Climate Resilience funded under the Climate Investment Funds Pilot Program for Climate Resilience. The program will be implemented by ADB, the World Bank, and the International Finance Corporation. ADB is also supporting the National Planning Commission in integrating climate resiliency into the upcoming National Development Plan (2011–2013).

The ADB-supported ongoing Energy Access and Efficiency Improvement Project is lighting the way for clean and efficient energy by distributing one million compact fluorescent lamps to homes and installing 1,000 solar and solar-wind streetlights in Bhaktapur, Kathmandu, and

Lalitpur. ADB's Green Transport Initiative Study will assist Nepal in developing sustainable transport policy and technology. ADB is funding the Kathmandu Sustainable Urban Transport Project to help reduce congestion and pollution in Nepal's capital. Among the key improvements under the project are the reorganization of the public transport network system and the introduction of two pilot bus routes financed through the government-managed Town Development Fund. The project will also promote the use of electric or low-emission vehicles thus reducing air pollution, setting aside car-free heritage routes to promote walking, and upgrading of facilities—especially sidewalks to make the city easier to get around on foot. Traffic management works and measures, such as improvement and monitoring of junctions, will also help solve congestion.

Sri Lanka

The Mahindra Chintana 10-year plan sets out the overarching development strategy of the country and acknowledges the importance of sound environment management. The Sri Lankan government's National Action Plan for the Haritha (Green) Lanka Programme provides a framework for environmental issues and programs, including climate change. Its mission is to focus on addressing critical issues, which if left unattended, would jeopardize the nation's economic development program. A specific section is dedicated to dealing with climate change and references policies and actions to counter its impacts, develop renewable energy resources, energy efficiencies, carbon sequestration, waste management, infrastructure vulnerabilities, zoning, rainwater harvesting, and adaptation measures to increasing vectors and food security measures. Sri Lanka's National Environment Policy reinforces these initiatives.

ADB's ongoing Forest Resources Management Sector Project seeks to mitigate greenhouse gas emissions and address the problems of deforestation and degradation of lands and soils. The project promotes sustainable land use by enjoining locals to participate in managing their forests in a sustainable way, thus improving livelihood opportunities and forest governance. ADB is also supporting the Strengthening Capacity for Climate Change Adaptation in Sri Lanka by preparing strategies for investment, institutional development, and increasing public awareness. Sector Vulnerability Profiles developed under this project highlight the key areas where climate change impacts may be felt in the country and form the basis for the ongoing development of a National Climate Change Adaptation Strategy.

- Sri Lankan fisherfolk's livelihoods are affected by climate change impacts



Maldives

The Maldives prepared its National Adaptation Programme of Action in 2006, identifying 11 priority adaptation projects focused on coastal and coral reef protection, adaptation in agriculture, freshwater and fishery sectors, and food security and health. Developing the resilience of the country's economically vital tourism industry is also a priority, especially the protection of access infrastructure and island beaches. The implementation of the Maldives' NAPA has

been boosted by the signing in December 2009 of a 4-year initiative called "Integrating Climate Change Risks into Resilient Island Planning in the Maldives." The project, cofinanced by the United Nations Development Programme (UNDP) and the Global Environmental Facility (GEF) will systematically assess the costs and benefits of different adaptation options in land use planning and coastal protection, and develop the necessary institutional capacity to implement the NAPA.

Going Forward

South Asia is a region where the global responsibility for addressing climate change should be particularly stressed. It is where one can clearly make a case for how countries that have contributed relatively so little to the causes driving climate change stand to lose so much from its adverse effects. Considering the region's extensive poverty, tackling its problems requires sustained, coordinated, and substantial efforts to rapidly spur development in critical sectors in a direction that is both low carbon and climate change resilient. If this is not done, the most vulnerable areas may soon reach their tipping points. More and more, reducing poverty and sustaining development cannot be separated from addressing climate change.

ADB has a long record of assisting South Asia in tackling climate change, but additional measures are still required. Together with other stakeholders, ADB will assist South Asia developing member countries to reduce greenhouse gas emissions and adapt to adverse impacts. By placing greater emphasis on poverty reduction in climate change interventions, mainstreaming private sector operations, and promoting regional cooperation and integration, low-carbon inclusive economic growth in the region can be realized.

Given ADB's resources and core competence, investments and technical assistance will focus on renewable and clean energy development, energy-efficiency enhancement, mass transport; and





selected urban development. Risk assessment and management, and general capacity development with specific investments in the agriculture and water sector will also be supported. ADB will ensure that these activities will maximize synergies with the initiatives of other development partners such as the World Bank, United Nations Development Programme, United Nations Environment Programme, and bilateral agencies.

ADB works and welcomes partnerships with developed and developing nations and leading knowledge institutions in the region to meet this considerable challenge, providing solutions that demonstrate real results from the local and regional to the global level.

Climate Change in South Asia: Strong Responses for Building a Sustainable Future

ADB's South Asia region is comprised of Bangladesh, Bhutan, India, the Maldives, Nepal, and Sri Lanka, extending from the highlands of the Himalayas to the atolls of the Indian Ocean. It is also home to more than 600 million of the world's absolute poor, who will be most vulnerable to the negative impacts of climate change. As critical sectors such as water, energy, and agriculture are affected, efforts at poverty alleviation and economic development are also threatened. ADB is responding to these threats with a comprehensive strategy that prioritizes solutions such as investing in strengthening policies, governance, and capacity support; expanding the use of clean and renewable energy; encouraging sustainable transport and urban development; promoting climate-resilient development, especially in water-dependent sectors; and managing land use and forests for carbon sequestration. ADB's support advances the climate change programs of its developing member countries and regional initiatives, moving with partners to integrate responses while continuing to work toward reducing poverty.

About the Asian Development Bank

ADB's vision is an Asia and Pacific region free of poverty. Its mission is to help its developing member countries substantially reduce poverty and improve the quality of life of their people. Despite the region's many successes, it remains home to two-thirds of the world's poor: 1.8 billion people who live on less than \$2 a day, with 903 million struggling on less than \$1.25 a day. ADB is committed to reducing poverty through inclusive economic growth, environmentally sustainable growth, and regional integration.

Based in Manila, ADB is owned by 67 members, including 48 from the region. Its main instruments for helping its developing member countries are policy dialogue, loans, equity investments, guarantees, grants, and technical assistance.